<<热物理概念>>

图书基本信息

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内容概要

《国际著名物理图书·影印版系列：热物理概念·热力学与统计物理学（第2版）》详细介绍了作为热力学和统计物理学基础的一些主要原理以及它们的应用。
书中以非常清晰的方式介绍和讨论了热力学和统计物理学中一些核心的概念，通过非常丰富的实例来说明新的概念、方法和原理，对于相关的历史背景和发现过程也作了比较具体的描述。
该书关于概念、原理和方法的应用涉及天体物理，大气物理，信息和通信理论，凝聚态物理等众多学科，体现了基本理论和方法的广泛适用性。
此外，每章末包含了小结，可以深入学习的文献简介以及许多的习题，有助于加深对概念、原理和方法的理解。
《国际著名物理图书·影印版系列：热物理概念·热力学与统计物理学（第2版）》可作为综合大学或师范院校物理学以及相关专业的热力学统计物理课程的教材。

作者简介

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章节摘录

 插图： 1.2 The thermodynamic limit In this section, we will explain how the large numbers of molecules ina typical thermodynamic system mean that it is possible to deal withaverage quantities. Our explanation proceeds using an analogy: imaginethat you are sitting inside a tiny hut with a fiat roof. It is rainingoutside, and you can hear the occasional raindrop striking the roof. Theraindrops arrive randomly, so sometimes two arrive close together, butsometimes there is quite a long gap between raindrops. Each raindroptransfers its momentum to the roof and exerts an impulse2 on it. If youknew the mass and terminal velocity of a raindrop, you could estimatethe force on the roof of the hut. The force as a function of time wouldlook like that shown in Fig. 1.1(a), each little blip corresponding to theimpulse from one raindrop. Now imagine that you are sitting inside a much bigger hut with a fiatroof a thousand times the area of the first roof. Many more raindropswill now be falling on the larger roof area and the force as a function oftime would look like that shown in Fig. 1.1(b). Now scale up the areaof the fiat roof by a further factor of one hundred and the force wouldlook like that shown in Fig. 1.1. Notice two key things about thesegraphs: (1) The force, on average, gets bigger as the area of the roof getsbigger. This is not surprising because a bigger roof catches moreraindrops. (2) The fluctuations in the force get smoothed out and the force lookslike it stays much closer to its average value. In fact, the fluctuations are still big but, as the area of the roof increases, they growmore slowly than the average force does. The force grows with area, so it is useful to consider the pressure, whichis defined as The average pressure due to the falling raindrops will not change as thearea of the roof increases, but the fluctuations in the pressure will decrease. In fact, we can completely ignore the fluctuations in the pressurein the limit that the area of the roof grows to infinity. This is preciselyanalogous to the limit we refer to as the thermodynamic limit. Consider now the molecules of a gas which are bouncing around in acontainer. Each time the molecules bounce off the walls of the container,they exert an impulse on the walls. The net effect of all these impulses isa pressure, a force per unit area, exerted on the walls of the container. Ifthe container were very small, we would have to worry about fluctuationsin the pressure (the random arrival of individual molecules on the wall,much like the raindrops in Fig. 1.1(a)). However, in most cases that onemeets, the number of molecules in a container of gas is extremely large,so these fluctuations can be ignored and the pressure of the gas appearsto be completely uniform. Again, our description of the pressure of thissystem can be said to be "in the thermodynamic limit", where we havelet the number of molecules be regarded as tending to infinity in such away that the density of the gas is a constant.

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《热物理概念:热力学与统计物理学(第2版)》可作为综合大学或师范院校物理学以及相关专业的热力学统计物理课程的教材。

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